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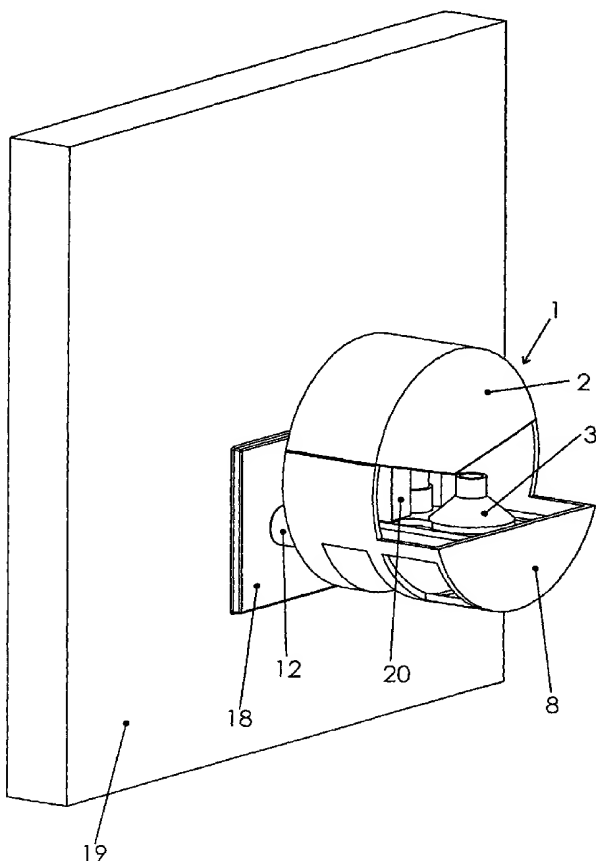
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[Continued on next page]

(54) Title: DEVICE FOR EMANATING ELECTRO-CONDUCTIVE FLUID SUBSTANCES



(57) Abstract: A device (1) is disclosed for emanating elec-
tro-conductive substances (10) comprising a tank (2) contain-
ing the substance to be vaporised, a protection cover in which a
diffusing stack (3) can be integrated, and two electrodes that are
in contact with a terminal board housed in a frame (8). The ac-
tuation of the emanating device (1) occurs when the substance
is absorbed by the terminal board, closing the circuit, rises the
temperature of the substance transforming it into a gaseous state
with its related dispersion into the surrounding environment.
This emanating device is of a simple construction, uses low-
cost plastic materials and does not require sophisticated regu-
lators.

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DEVICE FOR EMANATING ELECTRO-CONDUCTIVE FLUID SUBSTANCES

DESCRIPTION

The present invention refers to an electric device for emanating electro-conductive substances, particularly substances comprising perfumed compositions in order to perfume the surrounding atmosphere, or insecticide substances, disinfectants, etc.

The market of electrically-operating emanating devices for environments has become more and more widespread in these last years, with respect to system previously being present in the market. The birth of electric emanating devices, that have been proven more efficient, long lasting and able to be controlled, has played a major role in overcoming the market of traditional solid gels, since these latter ones have a limited efficiency, and of aerosols whose effects, though instantaneous, disappear in a short time.

One of the reasons why perfumes for environments are obtaining an increasing consideration by end consumers is due to the fact that the consumers are staying at home longer and longer.

The importance of perfumes at home highly increases when a house is occupied days and nights. Perfumes adjust smells coming from kitchen, pet beds and other sources of unpleasant odours. For this reason, perfumes and their diffusing devices are more and more searched for in order to create a pleasant environment.

Devices for emanating substances, such as for example the one disclosed in document US-A-5,976,503, are generally

devices that use resistances to heat wicks made of porous material, that is both thermoplastic and thermosetting, or ceramic material, which wicks, immersed into a deodorising substance, get impregnated by capillarity; alternatively, resistances are used that supply blocks of porous material drenched with deodorising fragrances, as disclosed for example in document US-A-5,574,821.

The most reliable emanating devices, as disclosed for example in document WO-A-00/06212, suitably use, in lieu of conventional resistances, some elements that are commonly called PTC thermistors. They are non-linear resistors, built with semiconductor materials, whose resistive value depends on the temperature: both on the ambient temperature, and on the temperature increase produced by dissipating power in the thermistor itself. They are manufactured by sintering various mixtures of oxides of materials such as iron, chrome, manganese, cobalt and nickel. At their pure state, these oxides have a high resistivity: however, they can be transformed into semiconductor materials by adding small amounts of a metal with different valence. Thermistors are used as temperature sensors or as stabilising elements and are characterised by a positive temperature coefficient; it must however be underlined that this is valid only within a certain temperature range.

The above-mentioned devices are either easily manufactured but with scarce efficiency, or with a good reliability but rather complicated in their construction.

Object of the present invention is thereby creating a device for emanating electro-conductive substances which can be easily manufactured, have low production costs and a high degree of reliability and performance.

Such object is realised by the device of the invention, that provides a tank containing the substance to be

vaporised, two electrodes in contact with a support made of plastic material such as sintered polyethylene, felt or the like, of an electrode-protecting cover in which a diffuser stack can be embedded and a frame with structural functions, in which the supply plug to be connected to household mains can be buried, through co-stamping.

The operating principle is based on the characteristic of ionic conductor provided by the solution, that, containing ions in a small concentration, is an electrolytic solution. The resistivity (or inversely the conductivity) of such solution depends on ion concentration and, when it is crossed by electric current, it is heated due to Joule effects. The produced heat is RI^2 , where R is the resistance of the solution included between the electrodes and I is the current intensity. Heating of the perfumed solution makes all volatile components evaporate.

In fact, if in a solution of electrolytes (salts, alkaline hydroxides), commonly called "II species conductors" (or ionic conductors), two metal foils are immersed and an electromotive force, or difference of potential, is imposed upon them, there is a passage of current between the two foils called electrodes.

One of the advantages of this application occurs at the time in which, when the deodorising liquid ends, the vaporising device automatically stops operating, the electrolytic solution between the two electrodes being ended, with related electric energy saving.

A further advantage consists in using, as deodorising solution, mainly substances with a high water percentage with the addition of a suitable electrolyte and aromatising elements, differently from currently-marketed vaporising devices that use costly solutions, coupling suitable fragrances with natural or synthetic oils such as aldehydes,

ketones, esters or terpenes, as disclosed in documents US-A-4,411,829 and US-A-4,434,306, or pesticide volatile substances such as p-dichlorobenzene, or therapeutic substances such as menthol.

It is known that deodorising solutions used in various models are composed approximately of the following percentages of substances:

- Various types of aromatic substances, in a percentage ranging between 40% and 70%.
- Solvents, in percentages ranging between 20% and 50%.
- Other substances, among which water, ranging between 3% and 4%.

From analyses performed on samples of these solutions, it therefore appeared that they are composed of a high percentage of aromatic substances, solvents and other products in minor amount, but, in any case, the water percentage being present is minimum or non-existing.

The emanating device of the invention instead advantageously exploits the electro-conductive properties of this substance, implying a high cost reduction in realising the solution to be vaporised.

The emanating device could be equipped with a suitable supply voltage adjusting system or with a mechanical system that makes the electrodes approach or go away one from the other, in order to be able to easily modify the amount of substance to be delivered in time. Moreover, the container can be of the interchangeable type, and for such purpose it could be equipped with suitable anti-filling valves, in order to prevent the consumer from filling-in the container itself with a liquid that not only is inadequate for the operations, but is also potentially dangerous.

These and other advantageous aspects of the invention, as claimed in Claim 1, will be better clarified in the

following description of the preferred embodiment together with the drawings and the enclosed Claims.

The present invention will be better described, as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 is a perspective view of the device of the present invention connected to household mains;
- Figure 2 is an exploded view of the device of the invention;
- Figure 3 is a cross view of the device of the invention; and
- Figure 4 is a detail of the support in contact with the electrodes.

The Figures show a currently-preferred, but non-limiting, embodiment of the device 1 for emanating electro-conductive substances 10 of the invention. In the description, all percentages of components are assumed in weight unless otherwise specified.

The device 1 of the invention substantially comprises: a support frame 8; at least one tank 2 containing the substance 10 to be emanated, connected to the support frame 8; and at least two electrodes 6 supplied by supplying means 12 such as for example a common electric plug to be connected to the mains outlet 18 (for example at 220 V a.c.) in a wall 19 (as can be seen from the operating view in Fig. 1). The electrodes 6, as can be seen, are adapted to generate heat in order to vaporise the substance 10 in the environment and are simultaneously adapted to stop the heating current flow when the substance 10 has been completely vaporised.

Differently from the prior art devices, the electrodes 6 are placed outside the tank 2, so that the level of

substance 10 does not affect in any way the conduction behaviour.

Moreover, the device 1 of the invention comprises at least one terminal board 7 housed in the support frame 8 and that is in contact with the electrodes 6 screwed thereon. The terminal board 7 is thereby adapted to perform the electric connection of the electrodes 6 through the electroconductive substance 10 with which it is drenched (if of a suitable material), or through which the substance 10 passes, if allowed by the arrangement of the terminal board 7 itself.

The device 1 finally comprises at least one unit 11 connected to the tank 2 and that simultaneously performs multiple functions, the first one of which, as previously seen, is being a protective cover for the electrodes 6. Moreover, the unit 11 is equipped with support means 20 for the tank 2, with delivering means 22 for the substance 10 and with diffusing means 3 of the substance 10 in the environment, thereby allowing to realise a device 1 with a compact configuration through a very simple and efficient multifunctional arrangement.

Fig. 2 shows an exploded view of the emanating device 1 of the present invention which points out the internal device construction.

The containing tank 2 obtained by blowing will preferably be realised in a transparent material, in order to point out the product level. Among the currently-preferred materials that can be employed, the following can be cited: glass, polypropylene, polyethylene terephthalate, or the like.

Once having ended the product, the device 1 will be again operating by using the containing tank 2 in its "refill" version: in such version, the tank 2 will be suitable sealed with a peelable film 28, impermeable to vapours.

This impermeable film 28 could be a sheet of aluminium, polypropylene or other materials that are particularly adapted for this type of application, hot- or ultrasound-welded.

The container will be pressure-engaged in the unit 11 by placing the mouth 24 of the containing tank 2 into the opening 22 whose walls have the function of channelling the substance 10 flow.

The possible protection film 28 will be pierced by the projection 26 that extends upwards in a coaxial way from the opening 22.

The unit 11, due to the way in which it is made, also operates as dispensing device for the substance 10 on the terminal board 7 in which the electrodes 6 are located, that are placed under the diffusing means 3, preferably composed of a diffusing stack 3.

The diffusing stack 3 is suitably shaped as a frustum of cone, with its greater surface oriented towards the terminal board 7, in order to convey the evaporation products towards the outside.

In a preferred variation, the diffusing stack 3 is equipped, at its end with smaller diameter from which the substance 10 goes out towards the environment, with at least one, and preferably two or more projections 30 adapted to make the exiting substance 10 move on a zig-zag path before its diffusion.

The material for the terminal board 7 must have certain characteristics, taking into account that the absorption of the substance 10 must occur in relatively short times, but at the same time an excessive absorption could make the substance itself go out.

Among the preferred materials, felt or a plastic porous material must be pointed out with pore sizes approximately

varying between 50 and 60 microns.

In another embodiment, not shown, the liquid solution 10 can be taken in contact with the terminal board 7 through the action of a plate made of plastic material whose surface is grooved. The grooves, in fact, operate as capillary vases along which the liquid substance 10 flows. The thereby-manufactured unit will be housed inside the frame 8.

The frame 8 is typically realised in injection-moulded plastics, such as polypropylene, polyamide or the like. For an easy and inexpensive manufacture, the frame 8 and the conductor elements 9 of the plug 12 can be moulded together integrally.

From the plug 12 two metal elements 9 extend towards the outside to be connected to the electric mains outlet.

Alternatively, the elements 9 can be made of plastics with metal inserts (not shown) in order to conduce electric current.

The preferable location of the electrodes 6 is shown in Fig. 3, since the electrode 6 surface exposed to substance vaporisation is minimum, thereby removing all problems linked to the electrode 6 oxidation due to vaporisation products.

The preferable distance of the electrodes 6, as shown in Fig. 4, is about 1 cm, but a good product vaporisation can be obtained also with longer distances, between 2 and 3.5 cm.

The electrodes 6 will obviously be hidden by an adequate protection (not shown) in order to avoid accidental contacts when operating the emanating device 1.

The emanating device 1 can suitably be moulded in different shapes, including the rounded one being shown, with a diameter of about 76 mm and a length of 70 mm. This chance of realising a compact and pleasing external shape is

an ornamental effect caused by the functional structure of the inventive device 1: this is a further advantage of the invention, since, in time, a design change when devising devices of this type has now occurred. Not many years ago, these products were devised only from the functional point of view, since their purpose was covering or masking unpleasant odours. Nowadays, instead, the devices of the environment deodorant type, are designed also in order to embellish and decorate the house.

The operation of the device 1 of the invention is as follows: by connecting the plug 12 to the supply, the device 1 is operated when the liquid solution 10 is absorbed by the terminal board 7 through the opening 22, and the circuit closure is thereby caused. When this occurs, the passage of current into the electrolyte starts and creates a temperature increase up to values varying from 60°C to 70°C. The maximum temperature values are reached in a relatively short interval of time (on the order of 1 minute). In this interval of time the temperature increases in an approximately constant way. It has been detected that, under the above-described conditions, using a vessel whose capacity is 50 ml, the device autonomy is about 12 continuous hours.

The conductivity of the water-based substance can vary between 63 and 273 us.

The electro-conductive substance 10 is obtained very simply by adding to distilled water about 0.1% of sodium sulphate and, according to the device mode of use, perfumed fragrances, pesticides, disinfectants, etc.

This type of emanating device 1 is particularly interesting due to its simplicity, since it has a reduced number of pieces, uses inexpensive plastic materials and does not need sophisticated adjustments by the consumer.

In the meantime, the device 1 of the invention is distinguished by a constant dispensing of the solution, during the whole life span of the product.

It is clear that the device 1 with reference to the Figures and the description can be, by making modifications and variations (for example the electrodes could be, in a further arrangement not shown, be advantageously housed in the tank part of the device 1, thereby keeping the efficiency of the device 1 itself constant in time), satisfy for a skilled person in the art particular and specific needs, all however included within the scope of the invention, as defined by the following Claims.

For example, due to its arrangement as shown, the device 1 of the invention can be operatively placed in a position in which the tank 2 is located above the electrodes 6 and the terminal board 7 with respect to the ground: in this way, the electro-conductive substance 10 is transported onto the terminal board 7 by its own weight through gravity.

CLAIMS

1. Device (1) for emanating electro-conductive substances (10), comprising:
 - a support frame (8);
 - at least one tank (2) containing the substance (10) to be emanated, said tank being connected to said support frame (8); and
 - at least two electrodes (6) supplied by supply means (12), said electrodes (6) being adapted to generate heat in order to vaporise said substance (10) in an environment and being adapted to stop an heating current flow when said substance (10) has been completely vaporised;characterised in that said electrodes (6) are connected outside said tank (2);
and in that it further comprises:
 - at least one terminal board (7) housed in said support frame (8), said terminal board being in contact with said electrodes (6) and being adapted to perform an electric connection of said electrodes (6) through said electro-conductive substance (10); and
 - at least one unit (11) connected to said tank (2), said unit (11) being equipped with: support means (20) of said tank (2), dispensing means (22) for said substance (10) and diffusing means (3) of said substance (10) into the environment.
2. Emanating device (1) according to Claim 1, characterised in that said terminal board (7) performs the electric connection of said electrodes (6) being composed of spongy material adapted to be permeated by said electro-conductive substance (10).
3. Emanating device (1) according to Claim 2, characterised

- in that said terminal board (7) is made of plastic material such as sintered polyethylene.
4. Emanating device (1) according to Claim 2, characterised in that said terminal board (7) is made of felt.
 5. Emanating device (1) according to Claim 1, characterised in that said terminal board (7) performs the electric connection of said electrodes (6) being equipped with a plurality of grooves in which said electrodes (6) are contained, said grooves further containing said electroconductive substance (10).
 6. Emanating device (1) according to Claim 1, characterised in that said support means (20) are composed of a pair of faced risers.
 7. Emanating device (1) according to Claim 1, characterised in that said dispensing means (22) are composed of an opening with projecting walls around which the outlet mouth (24) of said tank (2) is placed (2).
 8. Emanating device (1) according to Claim 1, characterised in that said dispensing means (22) are further equipped with a central internal projection (26) adapted to pierce a corresponding membrane (28) that closes the outlet mouth (24) of said opening (2) in order to allow the substance (10) to go out of said tank (2), said central internal projection (26) and said membrane (28) further allowing an interchangeability of said tank (2) after it is emptied from the substance (10).
 9. Emanating device (1) according to Claim 1, characterised in that said diffusing means (3) are composed of a stack shaped as a frustum of cone, from whose end with a shorter diameter the substance (10) goes out once having been vaporised by electrodes (6) heat.
 10. Emanating device (1) according to Claim 9, characterised in that said diffusing stack (3) is

equipped, at its own end with shorter diameter from which the substance (10) goes out towards the environment, with at least one, and preferably two or more projections (30) adapted to make the exiting substance (10) move on a zig-zag path before its diffusion.

11. Emanating device (1) according to Claim 1, characterised in that said supply means (12) are composed of an electric plug (12) adapted to be connected to an electric mains outlet (18).
12. Emanating device (1) according to Claim 1, characterised in that said device (1) is operatively placed in a position in which said tank (2) is located above said electrodes (6) and said terminal board (7) with respect to the ground, said electro-conductive substance (10) being transported on said terminal board (7) by its own weight through gravity.
13. Emanating device (1) according to Claim 1, characterised in that the electro-substance substance (10) that said device (1) is adapted to diffuse into the environment is composed of distilled water, sodium sulphate and perfumed fragrances.
14. Emanating device (1) according to Claim 1, characterised in that the electro-substance substance (10) that said device (1) is adapted to diffuse into the environment is composed of distilled water, sodium sulphate and pesticide or insecticide substances.
15. Emanating device (1) according to Claim 1, characterised in that the electro-substance substance (10) that said device (1) is adapted to diffuse into the environment is composed of distilled water, sodium sulphate and disinfectant substances.
16. Emanating device (1) according to Claim 1, characterised in that said device (1) is equipped with a

supply voltage adjusting system, in order to be able to easily modify an amount of substance to be dispensed in time.

17. Emanating device (1) according to Claim 1, characterised in that said device (1) is equipped with a mechanical system that makes the electrodes approach or go away one from the other, in order to be able to easily modify an amount of substance to be dispensed in time.
18. Emanating device (1) according to Claim 1, characterised in that said tank (2) is further equipped with anti-filling valves in order to prevent a consumer from filling said tank (2) with an undesired substance (10).

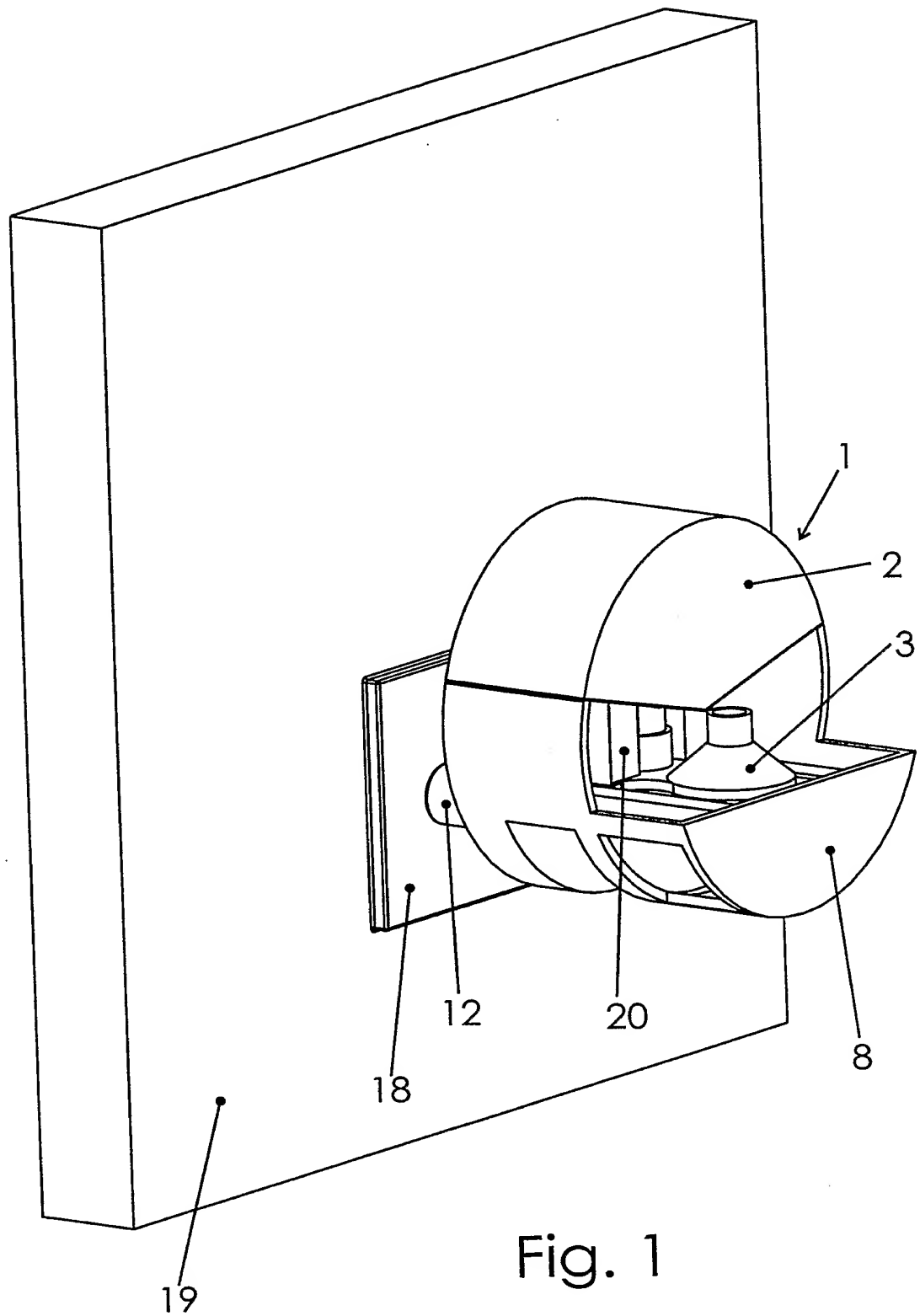


Fig. 1

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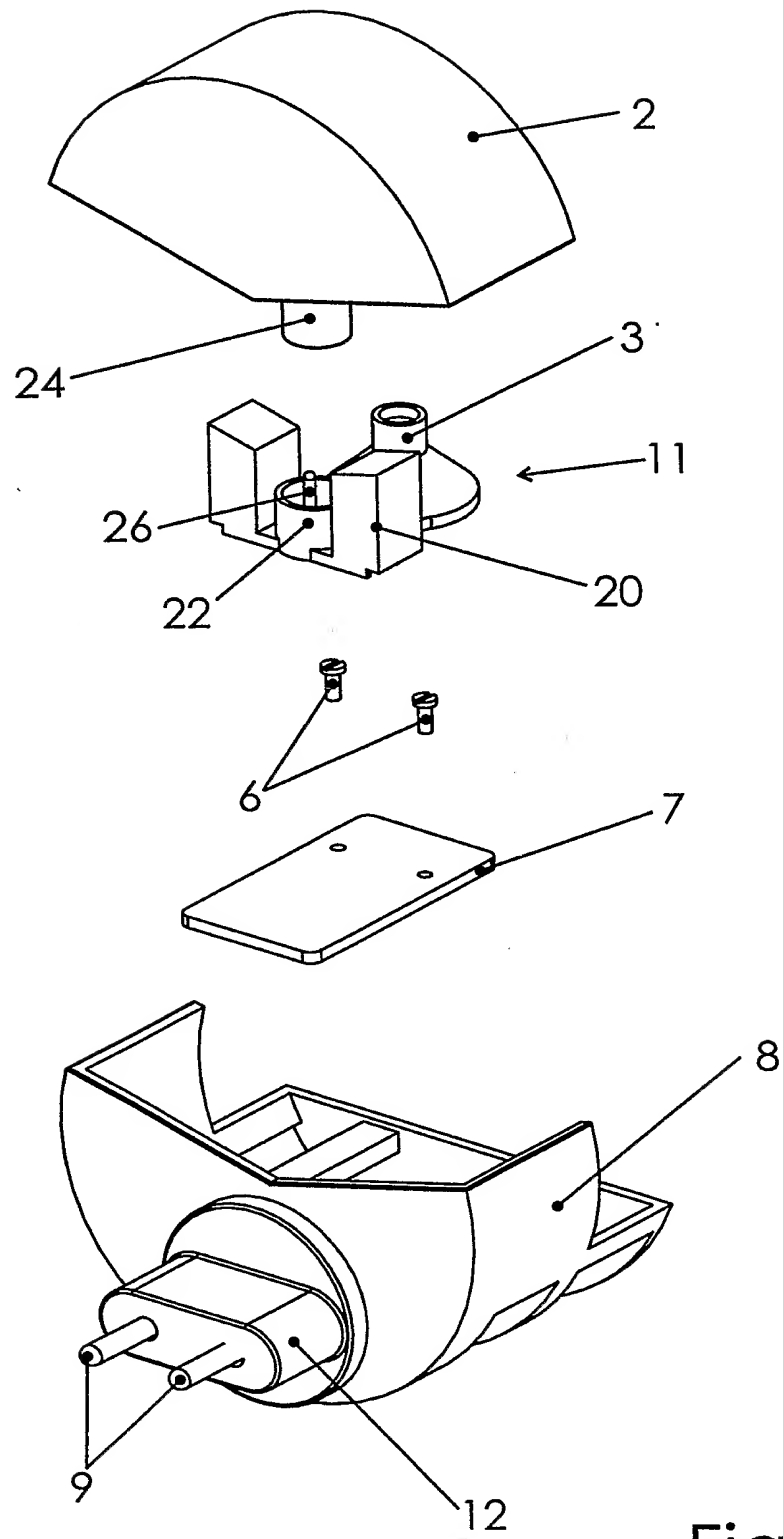


Fig. 2

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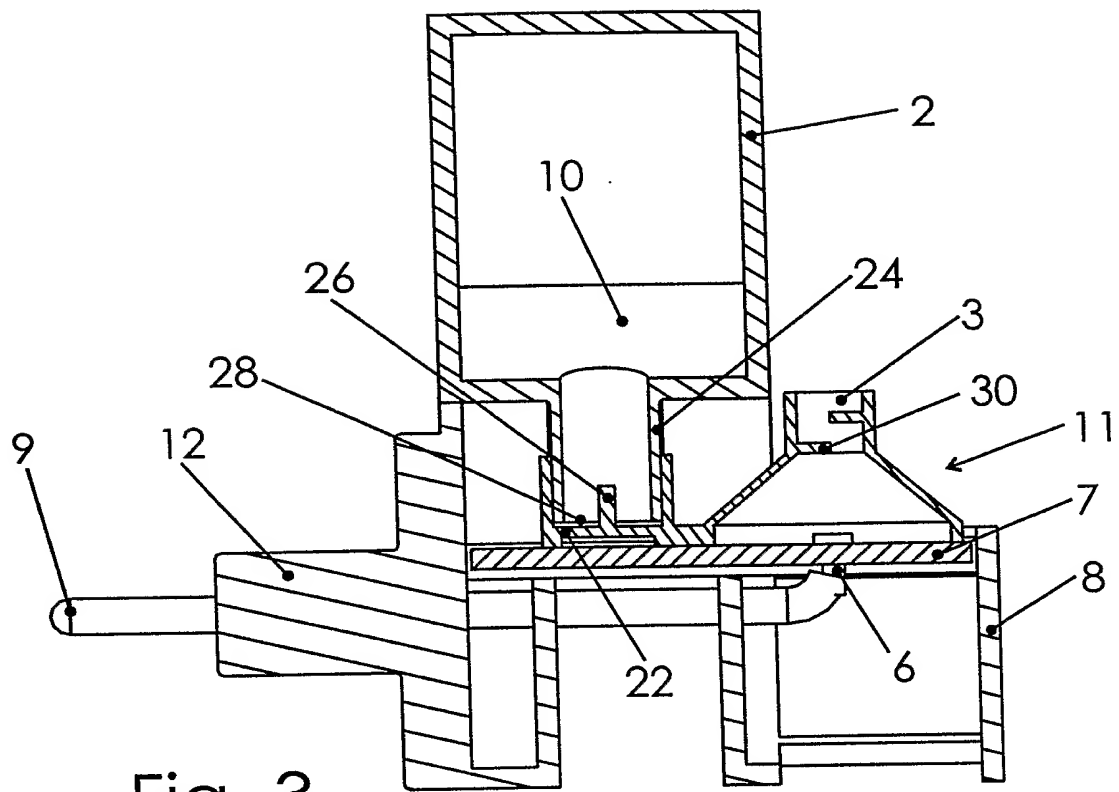


Fig. 3

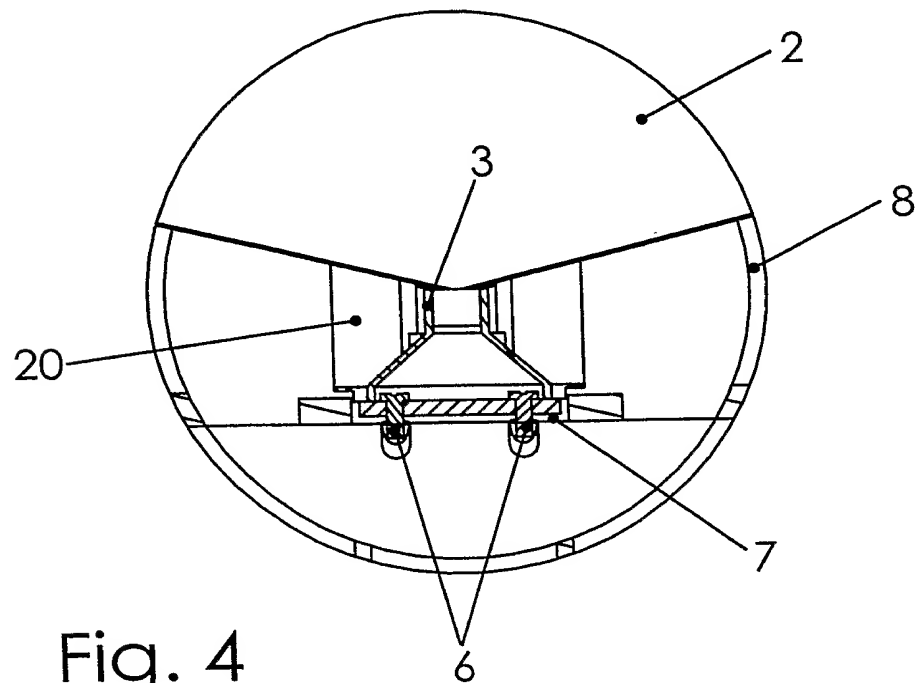


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 02/00552

A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61L A01M B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	FR 2 680 700 A (ARMINES) 5 March 1993 (1993-03-05) page 16, line 29 -page 17, line 22; figures ---	1-4
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A	US 5 875 968 A (MARTIN JOHN ET AL) 2 March 1999 (1999-03-02) abstract; figures --- -/--	1-18

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

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- *&* document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Int onal Application No
PCT/IT 02/00552

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	<p>US 5 940 577 A (STEINEL HEINRICH WOLFGANG) 17 August 1999 (1999-08-17) abstract; figures</p> <p>-----</p>	1-18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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